



## Operative technique

# The use of biosynthetic mesh to enhance hiatal repair at the time of redo Nissen fundoplication

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### Index words:

Redo fundoplication;  
Hiatal hernia;  
Mesh repair

### Abstract

**Objective:** There are a number of reports in the literature describing the need for a redo fundoplication in patients who have previously undergone open fundoplication. However, these data are not well characterized in our current era of laparoscopic surgery. The purpose of this report is to document the management of patients requiring a redo fundoplication who originally underwent a laparoscopic Nissen fundoplication.

**Methods:** After internal review board approval, the senior surgeon performed a retrospective chart review on all patients undergoing laparoscopic fundoplication between January 2000 and April 2006. Data collected included the patient's age, sex, neurologic impairment, need for gastrostomy, time interval between the initial and redo fundoplication, operative approach for the redo fundoplication, use of a biologic patch for the redo procedure, and length of follow-up.

**Results:** Two hundred seventy-three patients underwent laparoscopic Nissen fundoplication by the senior author during this time interval. Twenty-one patients have required a redo fundoplication and repair of the enlarged hiatus after laparoscopic fundoplication. No patient has undergone a redo procedure without the development of transmigration of the fundoplication wrap. A redo operation was performed without mesh in 13 patients, of which there were 4 recurrences (31%). The other 8 cases were repaired with Surgisis (Cook, Inc, Bloomington, Ind), and none of these have recurred, with a minimum of 11 months' follow-up and a mean follow-up of 26 months. In the 4 patients requiring a second redo procedure, the enlarged esophageal hiatus was reinforced with Surgisis, and none of these cases have recurred, with a minimum of 3 years' follow-up.

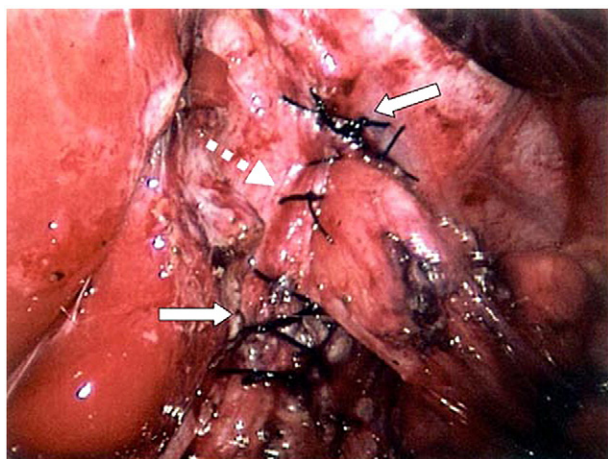
**Conclusions:** Our data support the use of a biosynthetic mesh to reinforce the crural closure during the repair of iatrogenic hiatal hernias in children.

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Minimally invasive antireflux operations are commonly performed by many pediatric surgeons with a high degree of efficacy in treating gastroesophageal reflux disease refractory to medical management [1-6]. The most significant complication of this operation and the main reason these

patients will require a second operation appears to be transmigration of the wrap through the esophageal hiatus [7-9]. As the Nissen wrap migrates into the lower mediastinum, it enlarges the esophageal hiatus. Although this situation is not rare, there are very little published data on this topic. Therefore, it appears that this complication is underreported and deserves careful investigation by surgeons performing laparoscopic Nissen fundoplication.

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**Fig. 1** Photograph of the crural closure with 2-0 silk sutures placed posterior and anterior (solid white arrows) to the esophagus. Esophagocrural sutures are placed circumferentially with 3-0 silk sutures (dotted white arrow) to secure the esophagus in an intraabdominal location and obliterate the space between the esophagus and crura.

Repair of iatrogenic hiatal hernias with redo fundoplication can be an arduous operation that requires careful dissection. Successful hiatal repair depends on coapting thin muscular tissue, which can be tenuous and can place these patients at risk for another recurrence. After experiencing some second recurrences during our early experience with redo fundoplication and repair of the enlarged hiatus without reinforcement with mesh, we modified our technique to add a biosynthetic mesh to reinforce the hiatal repair. In this report, we examine the data generated from this technique using mesh reinforcement.

## 1. Methods

Approval was obtained from the internal review board (no. 05-05-059X) of the Children's Mercy Hospital (Kansas City, Mo) before collecting data for this study.

A retrospective analysis was performed on a consecutive series of patients undergoing redo fundoplication by the senior author (GWH) over a 6-year period, from January 2000 through April 2006. Data collected included the patient's sex and age at initial laparoscopic fundoplication, presence of neurologic impairment, and need for gastrostomy at the initial operation. For patients who required a second operation, the time interval between the initial and redo operation, as well as the operative approach, the use of biosynthetic mesh, and the outcome of the second operation, was recorded. In the patients who required a third operation (a second redo procedure), the time interval between the second and third operations was recorded as was the operative approach, use of mesh, and outcome of the third operation. The time interval between the last operation and follow-up was recorded for all patients. Results for continuous variables are listed as mean  $\pm$  SE.

### 1.1. Operative technique

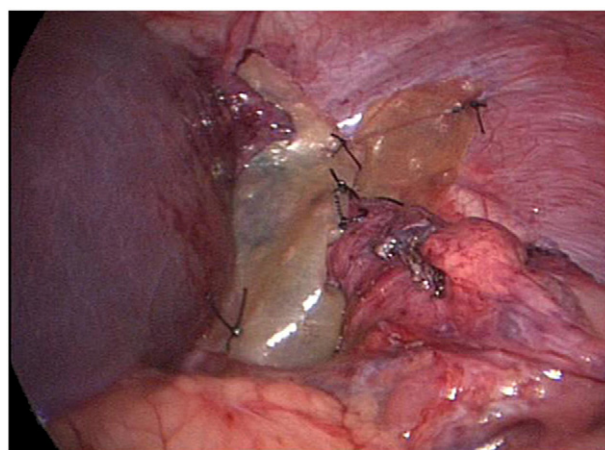
After adhesions were lysed to delineate the anatomy, the fundoplication wrap was reduced back into the abdomen. The hiatus was always very enlarged from the wrap transmigration. The crura were closed posterior to the esophagus with interrupted 2-0 silk sutures to provide tight approximation. The most anterior of these posterior sutures was also secured to the esophagus at roughly the 7-o'clock position. When an anterior diaphragmatic defect remained after the posterior crural approximation, this defect was also closed with interrupted 2-0 silk sutures (Fig. 1). The technique we currently use is to secure the crura to the esophagus circumferentially with 4 interrupted 3-0 silk sutures at the 8-, 11-, 1-, and 4-o'clock positions (Fig. 1).

When mesh was used, a square piece of Surgisis (SIS; Cook, Inc, Bloomington, Ind) mesh was divided with scissors on 1 side, creating pant legs. The body of the mesh was placed posterior to the esophagus, and the pant legs were wrapped around the esophagus to overlap on the diaphragm anterior to the esophagus. The SIS mesh was secured to the diaphragm and esophagus with multiple interrupted 3-0 silk sutures (Fig. 2).

Next, the fundoplication was taken down and redone in 14 cases, simply reinforced with additional 2-0 silk sutures in 5 cases, and left alone in 2 cases.

## 2. Results

During the study period, 273 patients underwent laparoscopic Nissen fundoplication by the senior author. All patients requiring a redo operation during this study period had an iatrogenic hiatal hernia with thoracic herniation of the wrap requiring repair of the hiatus. There were 21 patients who developed this complication as diagnosed by an upper gastrointestinal contrast study after presenting with vomiting with or without pain. There were no patients in



**Fig. 2** This photograph demonstrates the laparoscopic appearance of the SIS mesh wrapped around the esophagus. The mesh is secured to the esophagus and the diaphragm with 3-0 silk sutures.

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